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ABSTRACT

After providing examples of the use of computer-mediated communications networks such as Kids Network, Project INSITE, and Project Earth Lab to create real-world contexts for student learning, this paper notes that teacher learning and collaboration has been a secondary issue. It is argued that the urgency of such national efforts as school restructuring and pedagogical reform, combined with increasing accessibility of computer-based communications, creates both the need and the opportunity for research on teacher collaborations via networks. Theoretical and practical approaches to this research are outlined. The most effective networks, it is noted, are likely to be those that are designed to support a shared vision of the collaborative social and organizational reality desired by and for teachers and educational communities. (20 references) (GL)

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Computer-Mediated Communications Support for Teacher Collaborations: Researching New Contexts for Both Learning and Teaching

Paper to be presented at 1990 AERA Annual Meeting
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Introduction

Teacher collaboration with other teachers and with other people both inside and outside of the school community is increasingly recognized as necessary for achieving such important and urgent goals as increased professionalization and continuing education of teachers, school restructuring, and reform of curricula, instructional strategies and assessment methods. A rapidly growing number of teachers are using computer-based communications networks -- both local and remote -- to access information, facilitate such collaborations, and to build new local, regional, national and international communities. Such network activities range from a Local Area Network (LAN) within a school building, to a Remote Bulletin Board System (RBBS) for a town or school district, to teacher forums on general purpose commercial services such as CompuServe, to Teacher-LINK the University of Virginia system for student teachers and their university professors, to international educational networks such at AT&T's international Long Distance Learning Network (LDLN).

The substantial amount of time and resources being expended on the establishment of computer-based networks by and for teachers and students, and the importance of the goals these efforts serve, make it imperative that we create and build upon a coherent body of knowledge concerning effective design characteristics of such computer-mediated educational communities. At the same time, the variety of current and likely future experiments with such networks provides a rich array of contexts for conducting research on many different factors involved.

New Contexts for Both Teachers and Learners

The underlying motivation for much of the current experimentation in telecommunications for *student* learning, is the desire to provide more real-world contexts for learning than the typical classroom and

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textbook-based curriculum provides. For example, in reporting on the significantly higher ratings of student papers written to communicate with peers via a network as compared with papers written to a teacher for a semester grade, Cohen and Riel state, "Computer networks make it possible to increase the range of goals and audiences for students' writing and in doing so may provide a first step in the reintegration of students into the larger society." [Cohen & Riel, 1989 p. 156]. In discussing Kids Network, Cecelia Lenk says, "In a single classroom, students can easily study acid rain. They can measure the acidity of their local rain and look at the map in their textbook showing the pattern of acid rain across the country. But studying acid rain is far more powerful and compelling if they have measurements from classes all over the country, creating their own map of acid rain. [Lenk, 1989]. In describing their collection of project-based lessons using online databases, Hunter & Lodish explain: "Our goal is to help students become more active creative learners, both in the classroom and throughout their lives. Research shows that if students are to be able to transfer and apply skills in problem solving, information handling, and critical thinking, they must get practice in a variety of contexts." [Hunter & Lodish, 1989 p. 2]. Among the many efforts of the National Science Foundation to bridge the gap between practicing scientists and educators is a program for private sector partnerships to improve K-12 science and mathematics education. Typical of these projects is Project *INSITE* , a consortium of eight Indiana school districts, scientists at Eli Lilly and Merrell Dow Research Facility, science educators from Purdue University and Ball State University, the Indianapolis Children's Museum, the Indiana Cooperative Library Services Authority, and Dialog Information Services. "The goal was to create non-textbook science lessons which reflect current areas of concern and real world issues...teachers were encouraged to have their students pose questions to the scientists (via the network) and develop cooperative experiments which required the students to contact other students in the various schools." [Buchanan *et al*, 1989]. Another private sector partnership project headed by James Levin *et al* at Department of Educational Psychology at University of Illinois at Urbana-Champaign is exploring "teleapprenticeships". The notion of a teleapprenticeship draws upon the tradition of apprenticeship training where learning occurs in the context of practice, so that students can apply what they learn without facing problems of transfer. The project engages students, teachers and private sector partners in joint problem solving activities in mathematics and science.

Most of the interest and experimentation in educational computer-based communications networks has focussed on providing these diverse, compelling and real-world contexts for *student* learning, while teacher learning and collaboration has been a secondary issue or benefit. For example, the recent 182-page study report on distance learning by the U.S. Congress Office of Technology Assessment called *Linking for Learning: A New Course for Education*, [1989] devotes less

than a page to "Electronic Networks for Linking Teachers." A bibliography on the subject of educational computer-mediated communications contains over 300 citations but only half a dozen focusing on teachers. [Harasim, 1990]. Indeed there are cases of educational networks designed for student collaboration actually were designed in a way that creates disincentives for or barriers to teacher collaboration.

However, one could justify a comparable level of attention (as that devoted to student learning) to the creation of new social and organizational contexts to facilitate *teachers'* work and collaborations. The National Education Association (NEA) School Renewal project with IBM, supported by the U.S. Department of Education, is the first large scale systematic attempt to focus on roles of computer-mediated communications in teacher collaboration across schools on such issues as instructional strategies, curriculum, school climate, parent and community involvement, school restructuring and assessment. In prior research, teacher collaborations have been secondary or incidental to the focus on student interactions.

The following is an example of a serendipitous teacher collaboration effect of a network project originally focused primarily on student collaboration. Project Earth Lab developed Local Area Network (LAN) software to support a special sixth grade earth science curriculum focusing on cooperative learning groups and inquiry activities. "The goal in the Earth Lab project was to organize the use of computers for elementary school science in a way that would let the children use computers the way scientists do." [Newman *et al*, 1989, p.] Their initial concept of a microcosm of scientific work was an environment for cooperative *student* work groups supported by a school-wide network system designed for communication and sharing of data among the students. However the design of the network software was such that it reified the science project groups by their status as network workspaces. Teachers throughout the school began assigning small group work to the same (science) groups. "Never had there been a mechanism by which a social organizational structure created by one teacher in this school could be used by other teachers as a resource for managing instruction. The communication and sharing of data among the teachers was being mediated by the network technology, opening a new channel of communication for them." [Newman *et al*, 1989, p. 160].

Mapping Networks onto Desired Reality

Computer-mediated communications networks have certainly benefitted many individual teachers who have been participating in such networks as FrED Mail, BreadNet, BITNET, MIX, Kids Network, AT&T LDLN, Waternet, CISCO-NET, and the many local bulletin board systems. (e.g. [Katz *et al*, 1987; U.S. Congress, 1989, p. 13] However it

is understood that simply providing technology for electronic mail, computer conferences, bulletin boards and the like is not sufficient to achieve teacher collaborations of the quality and quantity desired nationally for reaching such goals as increased professionalism, school restructuring, etc.

I am conjecturing that the most promising network designs for the purpose of promoting teacher collaborations will be grounded in and reify a vision of the collaborative social and organizational reality they are intended to support or create. That is, a group developing a network (organization, software, data bases, etc) creates a shared vision of the kind of collaborative community they seek to create. They then build the network organization and choose software that supports that vision. (See, for example, [Feenberg & Bellman, 1990]). If one envisions hundreds or thousands of lonely, isolated teachers corresponding through electronic mail for solace, occasional advice, or references to literature, that is likely to be the extent of the collaboration achieved. If the teachers in a school building are committed, say, to the concept of "writing across the curriculum" and wish to achieve the level of teacher collaboration needed to implement that goal, they will design a network that (among other things) makes it easy for all teachers and students to access students' writings and others' responses to the writings from different locations around the school building. If one envisions a team of teachers, parents, children and scientists from five countries working collaboratively to analyze the data they have gathered in time to transmit a scheduled presentation to a UNESCO conference, one is likely to design yet a different network.

Approaches to Research and Analysis

There are a wide range of theoretical and practical approaches to the development of systematic knowledge concerning effective characteristics of the systems to support teacher collaboration goals. Hiltz (1990) for example considered four major approaches in designing the research for the Virtual Classroom: 1) approaches that focus on the technological characteristics of the system; 2) social-psychological factors focusing on characteristics of the users; 3) characteristics of the groups and organizations within which systems are implemented; and 4) "interactionist." (p. 141). Hiltz, Turoff and colleagues at the New Jersey Institute of Technology have been conducting studies of computer support for group communications for over fifteen years, and have demonstrated the value of their research in developing and improving systems. (e.g. [Hiltz,1986]). For example, Hiltz studied the relationship of computer communications to perceived levels of productivity [Hiltz, 1983]. She uses the concept of "social connectivity" as a unit of analysis. Similarly, Kiesler, Siegel and McGuire (1987) list technical and cultural issues that need to be studied including the question, "How do people develop a

communication network social structure using a technology in social transition?" (p. 249). Their experiments focus on the quality of group decisionmaking processes in computer-mediated communications compared with face to face meetings. Steinfield (1983) investigated variables associated with two types of network use: task use and socio-emotional use. Jones (1987) studied computer-mediated communications as an agent of professionalization for science teachers, based on experiences of science teachers on the NSF-supported CISCO-NET in New Mexico. Judith Kelley at the University of Lowell, MA, conducted a controlled experiment involving teachers' use of a network for such activities as creation of new ideas and the sharing of ideas with peers. [Kelley, 1987]

Newman [in press] characterizes the needed research as a formative experiment in which the educational environment (classroom, school, school district, profession, etc.) is the unit of analysis. Teachers and researchers conducting formative experiments aimed towards achieving a particular organizational goal can report the level and type of effort required to achieve it.

Margaret Riel [in press] uses the analytic framework of "participant structures" to compare interaction within and across computer network communities. The participant structures she uses to examine network interaction are:

- Organization of the network group: its size, common knowledge, interests, past experiences, and the physical location of the participants;
- Network task organization: the types of activities that participants engage in over the network;
- Response opportunities and obligations: ease of access to the interaction, including social and technical resources for sending and receiving messages, and the tacit or formal requirements for responding to a message.
- Coordination and support: the structures for facilitating group interaction, support for technical and curriculum development on the network and means of assessing the quantity or quality of the exchanges on the network.

Riel and Levin (1985) applied the participant structures framework to a comparison of several attempts to create network communities. Their analysis resulted in the following description of participant structures most likely to lead to success:

- A group of people who work together or share interest in a task, but who find it difficult to meet in the same location and or at the same time;
- A well-specified task to be accomplished by this group;
- Ease of access to a reliable computer network
- A sense of responsibility to the gruop and/or task

- Strong leadership and final evaluation of the group task

At the Center for Human Information Processing at the University of California, San Diego, Belyaeva, Cole and colleagues have been studying the changes in human consciousness that arise in the course of communication activity among people with different intersts and perspectives. [Belyaeva & Cole, 1989; Belyaeva *et al*, 1989]. Among other accomplishments, they have developed a system for the collection and analysis of written descriptions of children's activities witcomputers that permits principled connections to be drawn between verbal behavior and states of individual and social consciousness. They believe that higher levels of self-consciousness (reflexivity) and generalization have been achieved as a result of the new kinds of verbalization demanded by participation in the model system, both among children and adults. [Belyaeva & Cole, 1989, p. 56].

Conclusion

The urgency of such national efforts as school restructuring and pedagogical reform, combined with increasing accessibility of computer-based communications to teachers, creates both the need and opportunity for research in the context of teacher collaborations via networks. The substantial amount of time and resources being expended on the establishment of computer-based networks by and for teachers and students, and the importance of the goals these efforts serve, make it imperative that we create and build upon a coherent body of knowledge concerning effective design characteristics of such computer-mediated educational communities. The most effective networks are likely to be those that are designed to support a shared vision of the collaborative social and organizational reality desired by and for teachers and educational communities. This will involve changes in the context of teachers' professional life and work, analogous to the changing contexts for children's learning provided by computer-mediated networks. Within the context of such network designs, a wide variety of approaches to systematic analysis and experimentation are likely to be fruitful in establishing a coherent base of knowledge upon which future developments can be built.

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